Does Home-Court Advantage Exist in the NBA? Analysis of Three Seasons After COVID-19

Andrew Cai

Abstract

This study explores whether home court advantage has an impact on the outcome of NBA games. Many believe that playing at home helps teams win more often due to fan support and the familiarity of the stadium. I analyzed data from the 2021–22, 2022–23, and 2023–24 NBA seasons and used machine learning models to predict game results based on factors like shooting percentages, win streaks, and whether the team was playing at home or away. The best-performing model, a Random Forest model, reached ~60% accuracy. The results showed that recent team performance was more important than where they played, suggesting that home court advantage exists but plays a smaller role than expected. This research helps show what really influences game outcomes in professional basketball.

Introduction

The importance of a sports team's 'home court advantage' has been debated for centuries. This advantage also depends a lot on the sport, because some teams have little or no 'home court'. Because basketball is played in an indoor stadium with fans physically close to the players, it is an interesting sport to look at the 'home court advantage' question. Home court advantage has been around since the very beginning of basketball, with the home crowd roaring with each basket made and during good plays on defense. But can this change the outcome of the game? Many people believe that the fans create supportive and hostile energy, giving the home team an advantage and the away team a disadvantage. But is this advantage enough to consistently change the outcome of entire games?

In this paper, I will look into whether home-court advantage is real in the National Basketball Association (NBA). I will examine different factors that may contribute to the outcome of NBA games which connect to home court advantage. These factors include *average points per game*, *points allowed*, *team efficiency*, *back-to-back games*, and *3-point shooting percentage*. By looking at these factors, I wish to find how they influence game outcomes and if they change if you are playing at home or away. Additionally, I will look at psychological aspects such as the home crowd's impact and the number of fans. By evaluating these factors, this research seeks to determine whether home court advantage is actually a game-changing aspect of the game or just a myth.

Background and Literature Review

Home court advantage is an advantage in all sports, particularly in the NBA, where home teams win 61% of the time in the NBA (Entine and Small 2007). This was further studied by Price and Yan (2022), where during the bubble season, all teams played in the same place, and home teams only won roughly 48% of the games. This shows the impact of home court advantage, having a difference of around 12.8% from games played at a neutral location. According to Entine and Small (2007), home teams scored 3.24 more points than the visitors, showing an even greater impact from home court advantage in the NBA.

Another factor is referee bias. Caudil et al. (2014) found that NBA all-stars were awarded with an additional 0.32 free throw attempts per minute during the fourth quarter of NBA playoff games (due to their fame). That is around 3.84 extra free throws during the entire quarter, which could be the difference between winning and losing a game.

Additionally, fan attendance and passion does give the home team a slight advantage with every additional 1,000 fans giving an additional 1.74 points, including from fans impacting referee biases which result in more favorable calls for the home team (Ganz and Allsop 2024,

Kotecki 2014), demonstrating the massive impact that fans have in helping the home team win. According to Ganz and Allsop (2024), fans can add approximately 2.2 additional home wins over the course of a full NBA regular season, which can be the difference between making or missing the playoffs completely. The biggest factor influencing wins is still a team's superior performance and consistent play (Chang and Ran 2021), but a large fan base can give a meaningful and positive impact at home.

In this paper, I will be taking all of the games from the 2021–22 season to the 2023-24 season and using the *average points per game*, *points allowed*, *team efficiency*, whether or not they are playing *back-to-back games*, and *3-point shooting percentage* to create a model which will predict the outcomes of the games to determine if home court advantage is real.

Data

This research used data from the National Basketball Association, covering three regular seasons: 2021–2022, 2022–2023, and 2023–2024. The data was collected using nba_api, which gets game statistics from NBA.com. Using nba_api, game logs were downloaded for all 30 NBA teams, which gave us a dataset that includes 7,380 regular season games.

Each row in the dataset represents one game played by one team and contains information about that team's performance. Some of the main data points include: shooting stats such as field goal percentage, three-point percentage, and free throw percentage; team totals points scored, assists, rebounds, steals, blocks, and turnovers; game conditions, including whether the game was home or away, the opponent, and the game date; game outcomes, i.e. whether the team won or lost.

To make the data better for predicting future game outcomes, I created additional features based on each team's recent performance. These included: rolling averages of shooting percentages, rebounds, turnovers, and other stats over the previous 3, 5, and 10 games; win percentage trends over the past 10 and 20 games; home and away win rates to capture whether teams perform better at home or on the road; rest days, calculated from the number of days since the team's last game; and a target variable that indicates whether the team won its next game.

The final dataset included two categorical features and 72 numerical features based on historical stats and trends. This data formed the input for training a machine learning model to predict game outcomes.

Methodology

The main goal of this study was to build a machine learning model that could predict whether an NBA team would win its next game based on its recent performances and to see if home court advantage was real in the NBA. To do this, I utilized several different machine learning models and decided on the best performing model based on its accuracy. I attempted the following models: Linear Regression, Decision Trees, and Random Forest models. Ultimately, the best performing model was the Random Forest model. This is a model combining many decision trees and using the majority vote to make predictions. It is especially useful when working with a large number of features and complex data relationships.

The model was trained to predict a binary outcome: 1 if the team would win its next game, and 0 if the team would lose. Once trained, the model was tested on data to measure how well it could make accurate predictions. The model achieved an accuracy of 59.67%, which means it was right slightly more than half the time.

Analysis and Discussion

This performance is better than random guessing, and especially strong when predicting wins, as shown in the classification report:

Metric	Value
Accuracy	60%
Precision (Win)	58%
Recall (Win)	70%
F1 Score (Macro)	59%

To understand which features had the most influence on predictions, the model's built-in feature importance scores were examined. The most important variables were related to recent win percentages and shooting performance, suggesting that how well a team has played lately is a strong indicator of future wins. Included in **Figure 1** are the important features from the model:

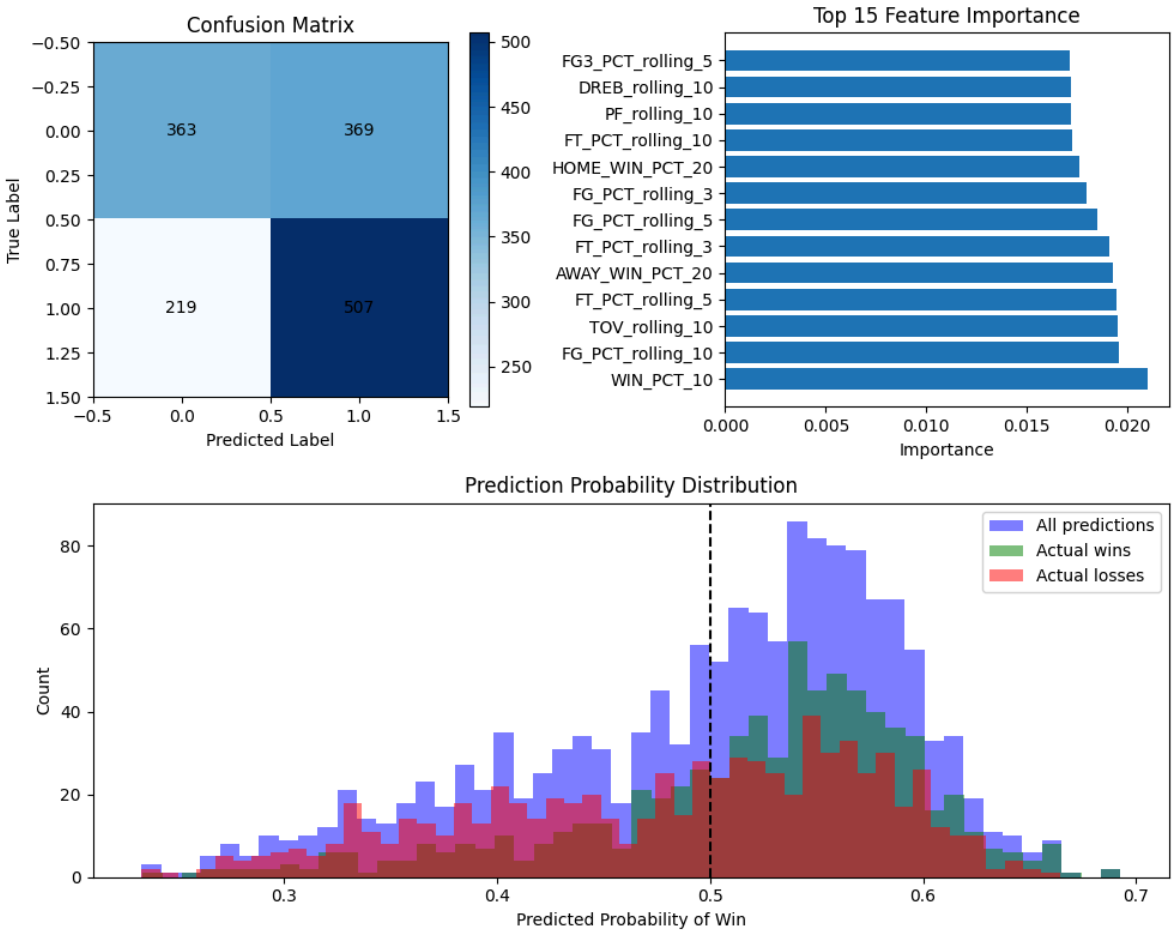

Figure 1. Confusion Matrix, Feature Importance, and Probability Distribution of Random Forest Model and Underlying Data.

Limitations and Future Work

One big limitation of this research was the amount of data available. While it included three full NBA seasons, it could have included many more things such as player injuries, how many fans were at each game, and referee decisions. These things could have a big impact on whether a team wins or loses, especially when playing at home or away. Also, because of time and computer limitations, only a few types of models were tested, which may have resulted in slightly lower accuracy.

If there were more time and resources, the research could be improved by adding more seasons, playoff games for each season, and more detailed data such as fan attendance, travel schedules, and referees to help us understand how much home court advantage really matters. More powerful models could be tested which could help us get a more accurate prediction on each game.

Conclusion

This research set out to find out if home court advantage really helps NBA teams win more games. After analyzing data from three full seasons and using a machine learning model to make predictions, the results showed that playing at home is helpful, but not the most important factor. The strongest factors of winning were how well a team had been playing recently, shown by their shooting and win streaks. This means that while home court can give teams a small boost, recent performance matters more. So, teams and fans should focus more on how the team is doing overall, not just where the game is played.

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